

CLAIMS

1. A touch panel device having at least one pair of excitation section for exciting surface acoustic waves by application of a burst wave and receiving section for receiving surface acoustic waves, which are arranged to face each other on a substrate capable of propagating surface acoustic waves, for propagating surface acoustic waves between said excitation section and said receiving section on said substrate and detecting a position of an object in contact with said substrate, based on received results by said receiving section, said touch panel device comprising:

a measuring section for measuring strength of surface acoustic waves received by said receiving section; and

a control section for controlling the wave number of the burst wave to be applied to said excitation section, based on the strength of surface acoustic waves measured by said measuring section.

2. The touch panel device of claim 1, wherein

said measuring section measures the strength of surface acoustic waves with the passage of time, and said control section controls the wave number of the burst wave, based on a change in strength of the surface acoustic waves with the passage of time which is measured over a predetermined period by said measuring section.

3. A touch panel device having at least one pair of excitation section for exciting surface acoustic waves and receiving section for receiving surface acoustic waves, which are arranged to face each other on a substrate capable of propagating surface acoustic waves, for propagating surface acoustic waves between said excitation section and said receiving section on said substrate and detecting a position of an object in contact with said substrate, based on received signals by said receiving section, said touch panel device comprising a smoothing section for smoothing the received signals of surface acoustic waves received by said receiving section.

4. A touch panel device having at least one pair of excitation section for exciting surface acoustic waves by application of a burst wave and receiving section for receiving surface acoustic waves, which are arranged to face each other on a substrate capable of propagating surface acoustic waves, for propagating surface acoustic waves between said excitation section and said receiving section on said substrate and detecting presence or absence of an object in contact with said substrate, based on received results by said receiving section, said touch panel device comprising:

a storing section for storing received results by said receiving section about surface acoustic waves propagated when no object is in contact with said substrate; and

a comparing section for comparing received results by said receiving section about surface acoustic waves propagated when an

object is in contact with said substrate and the received results stored in said storing section.

5. The touch panel device of claim 4, further comprising an updating section for updating the received results stored in said storing section.

6. The touch panel device of claim 4, further comprising:
a calculating section for calculating an attenuation start position and an attenuation end position of received surface acoustic waves, based on a comparison result obtained by said comparing section; and

a detecting section for detecting a contact position and/or a contact width of the object, based on the attenuation start position and attenuation end position calculated by said calculating section and the wave number of the burst wave applied to said excitation section.

7. The touch panel device of claim 5, further comprising:
a calculating section for calculating an attenuation start position and an attenuation end position of received surface acoustic waves, based on a comparison result obtained by said comparing section; and

a detecting section for detecting a contact position and/or a contact width of the object, based on the attenuation start position

and attenuation end position calculated by said calculating section and the wave number of the burst wave applied to said excitation section.

8. The touch panel device of claim 4, further comprising:
a calculating section for calculating an attenuation start position and a maximum attenuation position of received surface acoustic waves, based on a comparison result obtained by said comparing section; and

a detecting section for detecting a contact position and/or a contact width of the object, based on the attenuation start position and maximum attenuation position calculated by said calculating section and the wave number of the burst wave applied to said excitation section.

9. The touch panel device of claim 5, further comprising:
a calculating section for calculating an attenuation start position and a maximum attenuation position of received surface acoustic waves, based on a comparison result obtained by said comparing section; and

a detecting section for detecting a contact position and/or a contact width of the object, based on the attenuation start position and maximum attenuation position calculated by said calculating section and the wave number of the burst wave applied to said excitation section.

10. A touch panel device having at least one pair of excitation section for exciting surface acoustic waves and receiving section for receiving surface acoustic waves, which are arranged to face each other on a substrate capable of propagating surface acoustic waves, for propagating surface acoustic waves between said excitation section and said receiving section on said substrate and detecting a position of an object in contact with said substrate, based on received results by said receiving section, said touch panel device comprising:

a judging section for judging whether or not a plurality of contact positions are detected;

a calculating section for calculating a contact width of the object for each of the plurality of contact positions when a plurality of contact positions are detected;

a comparing section for comparing a plurality of the calculated contact widths; and

a determining section for determining that the contact position with the largest contact width is the contact position of the object.

11. A touch panel device having at least one pair of excitation section for exciting surface acoustic waves and receiving section for receiving surface acoustic waves, which are arranged to face each other on a substrate capable of propagating surface

acoustic waves, for propagating surface acoustic waves between said excitation section and said receiving section on said substrate and detecting a position of an object in contact with said substrate, based on received results by said receiving section, said touch panel device comprising a correcting section for correcting strength of surface acoustic waves received by said receiving section, according to propagation distances of the surface acoustic waves.

12. A touch panel device having at least one pair of excitation section for exciting surface acoustic waves and receiving section for receiving surface acoustic waves, which are arranged to face each other on a substrate capable of propagating surface acoustic waves, for propagating surface acoustic waves between said excitation section and said receiving section on said substrate and detecting a position of an object in contact with said substrate, based on received results by said receiving section, said touch panel device comprising:

a memory section for storing contact positions of the object detected at predetermined time intervals;

a distance calculating section for calculating a distance between a contact position detected just before and a contact position detected subsequently; and

a judging section for judging whether or not the calculated distance is larger than a predetermined value,

wherein, if the calculated distance is larger than the

predetermined value, the subsequently detected contact position is invalidated.

13. A contact position detection method in which at least one pair of excitation section for exciting surface acoustic waves by application of a burst wave and receiving section for receiving surface acoustic waves are arranged to face each other on a substrate capable of propagating surface acoustic waves, the surface acoustic waves are propagated between said excitation section and said receiving section on said substrate, and a position of an object in contact with said substrate is detected based on received results by said receiving section, said method comprising:

measuring strength of surface acoustic waves received by said receiving section; and

controlling the wave number of the burst wave to be applied to said excitation section, based on the measured strength of surface acoustic waves.